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Heuvelmans the Heretic and Hidden Animals

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Abstract

Cryptozoology seeks to study 'hidden animals' by separating 'metaphors and similes' from possible underlying insight. Variously described as a science, pseudoscience, or fringe field, cryptozoology may be viewed under the lenses of both heterodox science and orthodox science. Cryptozoology is heterodox in its unconventional methods and strategy; its 'fuzzy' data in the form of circumstantial and testimonial evidence; and its mostly amateur investigators. Cryptozoology also borrows from orthodox science, and in recent years may have influenced orthodox science: traditional ecological knowledge, pioneered in cryptozoology, is beginning to enter 'mainstream' scientific research, and these data have facilitated recent zoological (re)discoveries. Some contemporary cryptozoological studies have also applied more orthodox and rigorous statistical methodology. Controversial photographic taxonomy has been applied in both crypto- and conventional zoology, and cryptozoology has been investigated by qualified scientists at reputable institutions and in reputable academic journals. Cryptozoological methods, when applied more scrupulously, may have some unrealised scientific potential.

Keywords

cryptozoology, folk zoology, hidden animals, cryptids, palaeoscience

Introduction

As described by the founder of modern cryptozoology, zoologist and cryptozoologist Bernard Heuvelmans (2007), many fourteenth to eighteenth century naturalists quite casually documented the 'existence' of animals for which no conclusive physical evidence was available. For example, the descriptions of wild men and sea monsters in early editions of *Systema naturae* by biologist Carl Linnaeus (1735), and accounts of the mermaid and kraken by naturalist Erik Pontoppidan (1755). Such works began to phase out of zoological sciences with the development of modern zoology, namely with the widespread adoption of Linnaean taxonomy, type specimens, and nomenclatural

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rules from the eighteenth to nineteenth centuries on. Still, some works on putative hidden (and often 'monstrous') animals continued to be published. For example, the monograph on 'sea serpents' by zoologist Anthonie Oudemans (1892), and a popular science book on the unicorn and other 'romantic' animals by science writer Willy Ley (1941).

The term cryptozoology ('the science of hidden animals') first appeared in a review by book critic Ralph Thompson (1941) of the aforementioned work by Ley (1941). Cryptozoology has been variously defined. Heuvelmans (1984: 1), defined it as "a systematized search for unknown species of animals about which some testimonial and circumstantial evidence is available." Roy Mackal (1987: 9–10) from the University of Chicago defined it as "the investigation, analysis, publication, and discussion of all matters related to animals of unexpected form or size, or unexpected occurrence in time or space." In contrast, Loxton and Prothero (2013: 332) provide a less sympathetic description: "cryptozoology as it exists today is unquestionably a pseudoscience." The description of cryptozoology as pseudoscience on the one hand, and the definitions provided by Heuvelmans and Mackal on the other, are quite at odds. As we shall see, this is because cryptozoology has two sides. The first is cryptozoology as heterodox science, and the other is cryptozoology as orthodox science. The present study explores these two sides separately, and in synthesis.

Cryptozoology as heterodoxy

Heterodox methods

The cryptozoological method is, in essence, to study the traditional ecological knowledge of local fauna according to indigenous or local peoples, and to separate within this knowledge the 'metaphors and similes' from possible scientific insight. In the original 'textbook' of cryptozoology, *On the Track of Unknown Animals*, Heuvelmans (1958: 87) provides the following illustrative example: for an animal described as "a "devilish worm" that "spits fire" and which it is "death to look at,"… this merely means that the aborigines [*sic*] know of an animal that is worm-like… has a forked tongue like a flame, and which it is wise to avoid as its bite is fatal." The mythological language in this example serves two purposes. First, it is used to develop a cosmology or understanding of the environment within which the people find themselves, and second it is used to teach the people to respect nature and be wary of the existential threat nature can pose. Cryptozoologists take this a step further, arguing that such animal myths are based upon zoological truth, i.e., real but hidden or undiscovered animals.

Heuvelmans (1982: 2) called cryptozoology and palaeontology "sister sciences", and emphasised the significance to cryptozoology of living fossils such as the coelacanth, *Latimeria chalumnae*, which he described as "*stationary* species… creatures which have preserved a set of important or archaic characteristics… surviving from all past ages." Heuvelmans argued that "among the future zoological discoveries there may well be animals which are known but thought to be extinct". Indeed, J. Richard Greenwell's classificatory system for cryptozoology defines 'Category IV' animals as "[k]nown taxa which supposedly became extinct during historical times, but which may have survived far longer than originally believed, or may have survived to the present", and Category V animals as "[r]epresentatives of fossil forms believed to have become extinct during geological times, but which may have survived into historical times, or even to the present" (Greenwell 1985: 4). Similarly, in George M. Eberhart's 'Categories of Mystery Animals', group 4. animals are "[s]urvivals of species known only from the fossil record into modern times" (Eberhart 2005: 106).

The concept of deep time is an important element of cryptozoology, and many of the subjects of cryptozoology (often called 'cryptids' (Wall 1983)) have been speculatively identified as forms

known only from fossils. Examples of this tendency include bigfoot, sasquatch, and the yeti, all putatively identified as species of the extinct hominid genus *Gigantopithecus* (Shackley 1983; Heaney 1990; Krantz 1986, 1987); apes related to modern orangutans [genus *Pongo*] but much larger; 'lake monsters' including Nessie in Loch Ness and Champ in Lake Champlain, hypothesised as archaeocetes [ancient whales] (Mackal 1983) and as plesiosaurs [Mesozoic marine reptiles] (Mackal 1976); and folk animals of the African continent, similarly likened to dinosaurs such as sauropods and stegosaurs (Mackal (1987).

This strategy was coined the 'prehistoric survivor paradigm' by palaeozoologist Darren Naish (2010), and has been seriously criticised by zoologist Aaron Bauer (1992: 117) at Villanova University, who stated: "I do not accept the approach that any slight similarity between the description of a putative cryptozoon (no matter what the source and no matter how vague, or uncorroborated) and a picture in a paleontology book can constitute the grounds for a working cryptozoological hypothesis." Bauer was critical of the 'sloppy' application of cryptozoological methods.

Concerns have also been raised that cryptozoological methodology has been misused to justify belief in anti-evolutionary Young Earth creationism (Acorn 2023). 'Creationist cryptozoologists' search for prehistoric survivors in order to refute scientific theories of evolution and the age of the Earth (Thunig 2017). For example, the Christian apologetics organisation *Answers in Genesis* has argued that 'tales of unknown creatures make sense in a biblical framework of history" (Driver 1997).

At times, attempts to rigorise cryptozoological research with statistical methodology have come up short, for example, due to data reliability and methodological issues (e.g., see the technical critiques of King et al. (2020) by Paxton (2020), and of Bauer (2022) by Foxon (2023a)) and because of nonparsimonious inferences (e.g., see discussion of Kojo (1991) by Mackal (1992) and Foxon (2023c)).

The unconventional methodology of cryptozoology and its frequently dubious application distinguish cryptozoology from orthodox sciences.

Heterodox evidence

Much of the evidence presented for the existence of putative cryptids does not meet the evidentiary standards of conventional sciences. Indeed, Heuvelmans *defined* cryptozoology as the study of testimonial and circumstantial evidence, as opposed to 'autoptical' evidence, i.e., physical evidence like type specimens and fossils. Marine scientist and cryptozoologist Paul LeBlond (1997: 3) stated that "cryptozoology deals with fuzzy data."

Of course, it should be noted that if the evidence available for a given cryptid met the evidentiary standards of conventional sciences, then the animal would no longer be a cryptid, and would pass from cryptozoology to conventional zoology. In this sense, cryptozoology is at something of a disadvantage; any of its successes would leave its purview, so that the field is left only with those still lacking sufficient evidence for zoologists, and it is precisely those putative animals lacking sufficient evidence which make most zoologists skeptical of cryptozoology.

The unconventional evidence of cryptozoology includes the following.

- Descriptions of animals in oral tradition, e.g.,:
  - An amphibious creature described in the mythopoetry of the Indigenous Australians called the 'bunyip' or 'Melong' (Kerr 2003), suggested by some to be an as-yet undiscovered animal (Heuvelmans 1958; Quirk 2023), and by others to be purely cosmological (Kerr 2003; Quirk 2023).

  - A large terrestrial animal described by Native Amazonian peoples called the 'mapinguari' or 'juma', suggested by some to be an extant ground sloth (Oren 1993, 2001), and by others to be misidentified anteaters (presumably myrmecophagids) and heresay (Martin 2005).
  - A supernatural flying animal described in the Sioux creation myth called the 'thunderbird' (Mayor 2013), suggested by some to be a surviving teratornithid (Coleman 1985), and by others to be purely mythological (Nez 2012; Senter 2019).
- Illustrations of animals not known today in ancient works, e.g.,:
  - Bas-relief dragons on the Ishtar gate of Babylon, suggested by some to depict an ornithopod dinosaur (Heuvelmans 1958; Ley 1941), and by others to depict an imaginary animal (Valentiner 1931).
  - A statuette ungulate on a Sumerian chariot ring, suggested by some to depict the extinct giraffid genus *Sivatherium* (Colbert 1936), and by others to depict the extant fallow deer *Dama dama* (Reese 1990).
  - A statuette quadruped from the late Chou Dynasty, suggested to depict a giant (i.e., tapir-sized rather than rabbit-sized) hyrax *Pliohyrax*, otherwise known only from fossils discovered in the same general geographical area as the statuette (Janis 1987).
- Tracks and footprints of ambiguous origin, e.g.,:
  - The Menlung Glacier 'Abominable Snowman' tracks of the Eric Shipton expedition, suggested by some to belong to a surviving *Gigantopithecus* (Tschernezky 1960; Tschernezky and Cooke 1975), and by others to belong to the Asian black bear *Ursus thibetanus* (Taylor 2018).
  - The 'Walla Walla' footprints, suggested by some to belong to sasquatch (Krantz 1983), and by others to be hoaxes (Baird 1989; Bodley 1988).
  - The 'dinosaur' tracks of the Percy Sladen Expedition, suggested by some to belong to a surviving sauropod dinosaur, and by others to belong to the hippopotamus *Hippopotamus amphibius* (Mackal 1983).
- Photographs and films of unidentified objects (often low-resolution or grainy), e.g.,:
  - The 'Mansi' photograph of the Lake Champlain monster, suggested by some to depict a plesiosaur and by others to depict driftwood (Radford and Nickell 2006).
  - Various photographs alleged by some to depict living thylacines in Australia, and suggested by others to depict the red fox *Vulpes vulpes* with mange, or the Tasmanian pademelon *Thylogale billardierii* (Dunlop 2016; Ryan 2021).
  - The 1993 Craigieburn Forest Park photograph, suggested by some to depict a live dinornithiform (moa), and by others to depict the red deer *Cervus elaphus* (Spittle 2010).
- Modern eyewitness sightings of apparently unknown animals, e.g.,:
  - Sightings of woodpeckers in the United States, suggested by some to be the extinct ivory-billed woodpecker *Campephilus principalis* (Fitzpatrick et al. 2005; Latta et al. 2023), and by others to be the extant pileated woodpecker *Dryocopus pileatus* (Sibley et al. 2007).
  - Sightings of 'big cats' in the United Kingdom (British Big Cats Society 2006), suggested by some to represent an unrecorded prehistoric species (Francis 1983), and by others to be escaped exotic pets or else misidentified domestic cats and dogs (Goss 1992).
  - Sightings of unknown bipedal animals across North America (Bigfoot Field Researchers Organization 2023), suggested by some to be surviving primitive apes and by others to be sightings of the American black bear *Ursus americanus* (Foxon 2024a).

More often than not, cryptozoological evidence gets published in mainstream media outlets (e.g., the *BBC* (Lawson 2008*a*; Dunlop 2016), *The Telegraph* (Foggo 2003; Pinkstone 2023), and *The Guardian*

(1960)), as well as in science magazines (e.g., *New Scientist* (Braithwaite and Tucker 1968; Douglas 1986), *Science* (Swan 1958; Wilcove 2005), and *Smithsonian Magazine* (Moon 1978; Wiley 1976)). These are often communicated with an ironic tone, to the chagrin of serious cryptozoologists. Cryptozoological articles in peer-reviewed academic journals are less common and often controversial. As an extreme example, one article purporting to have identified sasquatch DNA from hair samples was rejected by *Nature* and *PLOS One*, and was subsequently self-published in a new journal that was created by the authors of the sasquatch article specifically for the publication of said article (Hill 2013; Ketchum et al. 2012).

There is also a tendency for cryptozoological evidence to disappear or otherwise elude investigators. For example, cryptozoological encounters are plagued by camera mishaps, including claims of cameras having been accidentally set to macro, cameras being forgotten or out of hand, film being destroyed or doubly exposed, negatives being thrown away, and conditions being unfavourable for photography (Foxon 2024b). Similarly, specimens of cryptids have reportedly been lost, stolen, burned, broken, and even washed away (Foxon 2024b).

The unconventional evidence of cryptozoology, its less reputable outlets, and the reported tendency for such evidence to disappear generates skepticism among the orthodox scientific community.

Heterodox investigators

Another unconventional feature of cryptozoology from the perspective of the sciences is that it involves mostly amateur investigators. This includes individuals with no scientific background, as well as organisations with a mix of scientists and amateurs, such as the British Columbia Scientific Cryptozoology Club (BCSCC; www.bcscc.ca) in Canada, the Centre for Fortean Zoology (CFZ; www.cfz.org.uk) in the United Kingdom, and the International Cryptozoology Society (ICS; www.iczsonline.com). These organisations produce their own publications with a mixture of amateur and scientific contributions, e.g., the BCSCC Newsletter, the (almost) annual CFZ Yearbooks, and the ICS Journal (one volume). Indeed, it is amateur cryptozoologists who have 'taken over' the field since the dissolution of the International Society of Cryptozoology (ISC) circa 1998.

The reasons for interest in cryptozoology among amateurs are numerous. Some are drawn to cryptozoology through lived experience, i.e., first-hand sightings of animals that the witness could not identify. For example, there have been over 5,000 alleged sightings of bigfoot in North America and over 1,000 sightings of the Loch Ness Monster in Scotland (Bigfoot Field Researchers Organization 2023; Campbell 2023). Thus, a large number of people have experienced (or believe they have experienced) cryptozoological phenomena, and have subsequently become involved in cryptozoological investigation through online forums and such events as bigfoot conferences. Another factor may be simply wanting to believe in what is seen as an open secret or conspiracy (Radford 2024). This is common to practically all fringe fields and heterodoxies (Shermer 2009).

Among proponents of heterodox science including cryptozoology, there is a tendency to view criticism (which may or may not be substantial) as the dogma of orthodox science. There are, of course, examples of now widely accepted scientific theories that received extreme opposition from proponents of obsolete theories. For example, geophysicist Alfred Wegener's theory of continental drift, described in Wegener's *The Origin of Continents and Oceans*, explained the present location of the Earth's landmasses as arising from the separation and gradual drifting apart of a single supercontinent in the deep past (Wegener 1924). Wegener's theory was accepted only after five decades of stubborn opposition. Similarly, naturalist Charles Darwin's theory of evolution by natural selection, described in Darwin's *On the Origin of Species*, explained the present diversity of life as arising from cumulative variations within beings which increase odds of survival and which are propagated through inheritance

(Darwin 1859). Like Wegener, Darwin was famously criticised for his theory, in large part due to its incompatibility with certain religious views.

Just as Wegener and Darwin eventually 'won the day', Heuvelmans similarly hoped for a revolution in zoology and palaeontology with the discovery, via cryptozoological methods, of species hitherto unrecognised as still living by conventional zoologists and palaeontologists. Amateur cryptozoologists similarly hope that what they see as scientific truth will win the day with the discovery of indisputable proof for one or more cryptids. Alas, evidence for the poster children of cryptozoology, namely the mystery hominids and lake monsters, remains unconvincing to most scientists.

Cryptozoology as orthodoxy

Orthodox methods

Although cryptozoology's poster children have not been discovered, other animals have been discovered or rediscovered through remarkably cryptozoological methods. Predating the coining of the term 'cryptozoology', Heuvelmans (2007) describes "[the] first marked success of the cryptozoological approach" as the discovery in 1829 of the mountain tapir, *Tapirus pinchaque*. As noted by Heuvelmans (2007: 123), the discoverer of this tapir, naturalist François Roulin, was led to suspect the existence of the tapir on the basis of bibliographical research, namely on "reports by old Spanish historians." In recognition of the traditional ecological knowledge upon which the discovery was made, the species name, *pinchaque*, is a reference to the 'hairy ghost' of South American folklore.

Similarly, gorillas were once hidden animals; hidden at least from conventional zoology. As described by Heuvelmans (1958), for centuries gorillas had appeared as monsters in the various 'travellers' tales' of Europeans who had visited the African continent, and were of course well known to the African peoples long before. It was not until 1847 when the western gorilla, *Gorilla gorilla*, became the first gorilla to be formally described for science, after which naturalists continued to remain skeptical of eyewitness reports of similar animals elsewhere in Africa until these too were validated from 1901 to 1903 with the first specimen and description of an even larger gorilla species, the eastern gorilla *Gorilla beringei*, again known already to local peoples (variously as 'ngagi' and 'ngila').

Most famous of all, the okapi *Okapia johnstoni* was discovered to conventional zoology through the investigations of Johnston and Erikson circa 1900, who enquired about the existence of an animal known to the Congolese Pygmies and variously called by them the 'atti', 'Ndumbe', or 'okapi' (Johnston 1900; Lankester 1901; Sclater 1901). It was only through consultation with the local peoples, the study of their folk zoology, and their guidance during expeditions that the existence of the okapi was demonstrated in orthodox zoology with the ultimate discovery of okapi specimens through these means. Not only was the discovery of the okapi cryptozoological, but the okapi is also precisely the kind of living fossil anticipated by Heuvelmans.

Of course, Heuvelmans was writing *after* the discoveries of the tapir, gorillas, and the okapi, and so did not predict them. This begs the question, have other 'ethnoknown' animals been identified through cryptozoological means (i.e., circumstantial and testimonial evidence) since the inception of cryptozoology? The answer is yes. For example:

- The giant woolly flying squirrel, *Eupetaurus cinereus*, was thought to be extinct for decades until its rediscovery in 1994. As described by naturalist Scott Weidensaul (2002), conventional zoological efforts failed to recover new specimens of this squirrel until local people of the Pakistan

Himalayas were recruited, who, relying upon their traditional ecological knowledge, produced a fresh specimen within hours of their recruitment. The squirrel already featured in the folklore of the local people (Weidensaul 2002).

- The dingiso tree-kangaroo, *Dendrolagus mbaiso*, of Irian Jaya, Indonesia was described by zoologists in 1995, but was known to local Moni people for centuries, and featured prominently in their cosmology (Flannery, Boeadi and Szalay 1995). Its formal description was aided significantly by the traditional ecological knowledge of local Moni, Damal and Dani informants, including details on its terrestrial and treeclimbing behaviour, as well as its distinctive call, tameness, diet, and distribution (Flannery, Boeadi and Szalay 1995). The species name, *mbaiso*, is a tribute to the traditional conservation measures of the people of Melanesia who ensured its survival; in the Moni people's language, it means 'the forbidden animal'. Flannery, Boeadi and Szalay (1995: 81–82), the zoologists who described the animal, concluded with: "We owe a considerable debt of acknowledgement to our patient informants and skilled hunters… who were so interested in and helpful with our work." Further research on the dingiso has been published "based on long-term interactions with local communities" (Wild and Balke 2018: 1).
- The highland mangabey or kipunji monkey, *Rungwecebus kipunji*, was discovered in 2003 by primatologists and conservationists in the Southern Highlands of southwest Tanzania through a search that was initiated and facilitated by "rumours about a shy and atypical monkey known as *Kipunji*" collected during interviews with villagers around Mount Rungwe (Jones et al. 2005: 1161). The scientists involved stated that "[t]he local Wanyakyusa have a strong oral tradition based on both real and mythical forest animals," and referred to the discovery of the kipunji monkey as "validation of these rumours." Rossi, Gippoliti and Angelici (2018) have further documented that of 42 discoveries, re-discoveries, and descriptions of new ape and monkey species between 1980 and 2018, 17 of these (over 40%) were aided by circumstantial evidence and traditional ecological knowledge.
- The black-naped pheasant pigeon, *Otidiphaps nobilis insularis*, of the D'Entrecasteaux Islands in Papua New Guinea, was previously thought to have become extinct circa 1882, but in 2022, ornithologists successfully captured footage of living pheasant pigeons after conducting "countless interviews with locals" and applying the local ecological knowledge obtained to the search (Turnbull 2022). *Audobon Magazine* journalist Andy McGlashen (2022) described this event as "highlighting the value of local ecological knowledge as scientists seek out other long-missing species."
- In 2023, a pair of cryptozoological discoveries were announced in the same month. Namely, an expedition including University of Oxford researchers rediscovered Attenborough's long-beaked echidna, *Zaglossus attenboroughi*, decades after it was thought extinct by "work[ing] closely with local villages" and relying upon "the support of local guides" (University of Oxford (2023); Fisher and Northcott (2023); the animal once again featured in local tradition); while the Vangunu giant rat, *Uromys vika*, was only described for science by Field Museum of Chicago researchers in 2017 after years of reports from Soloman Islands locals, and in 2023, the first camera trap images of these animals were published from camera sites "selected by members of the study team from Zaira Village… using their traditional knowledge" (Lavery et al. 2023: 3).

As described earlier, studying knowledge of local fauna as described by local peoples in order to obtain zoological insight is precisely the method of cryptozoology. In this way, cryptozoological methods have quietly entered orthodox science.

Orthodox sciences 'evolve' in the sense that they are not fixed, but are updated in light of new evidence (the opposite has been considered true of heterodox or pseudo-sciences, e.g., see Alcock (1981)). In cryptozoology, there are some examples of just this sort of 'evolution' and updating of facts. For example:

- The 'Ri', 'Ilkai', or 'Pishmeri' is a mermaid-like animal in the folklore of the peoples of New Ireland, Papau New Guinea (Wagner 1982). Originally speculated by some cryptozoologists as a possible new species (Britton 1984; Ellis 1984; Greenwell 1984; Wagner 1984), cryptozoologists' fieldwork revealed through underwater photography that the animal was none other than the dugong *Dugong dugon* (Williams 1985). This finding was welcomed by the cryptozoology community, including by secretary-treasurer of the ISC, J. Richard Greenwell (1986), in the pages of the ISC's flagship journal *Cryptozoology*.
- The 'onza' is a mystery big cat linked to Aztec folklore in Mexico (Heuvelmans 1986). Originally speculated by one cryptozoologist to be a surviving American cheetah from the Pleistocene, *Miracinonyx* (Hemmer 1985), pathological examination of an onza specimen obtained through cryptozoologists' fieldwork revealed that the cat (or at least this individual) was none other than an emaciated cougar, *Puma concolor*, with the results again published in *Cryptozoology* (Dratch et al. (1996); though it is not impossible that other animals dubbed onza could represent a local variant of the cougar. Time may tell).
- Similar to the 'onza', the Peruvian 'striped tiger' and 'anomalous jaguar' were two mystery big cats known from reports of local hunters. After skull specimens were obtained in the 1990s (Hocking 1996), morphometric analyses determined that they were consistent with those of the jaguar, *Panthera onca* (Naish et al. 2014).
- The 'Florida Monster' was a globster, i.e., a decomposing carcass washed ashore on St. Augustine beach in 1896. Naturalists of the time and other scientists in the decades that followed originally considered the 'monster' to represent a new species of giant cephalopod (e.g., Mackal (1986); Verrill (1897)), but more recent analyses of Florida Monster specimens revealed it as the carcass of a whale (Pierce et al. 1995, 2004). Although this finding was originally met with opposition by some cryptozoologists (Mangiacopra et al. 1996), other authors subsequently accepted these findings as a mystery solved (e.g., Goudsward 2016).

Eyewitness sightings of hidden animals, the basis of cryptozoological methodology, have also been analysed more recently in orthodox and rigorous statistical models. Sightings of the thylacine *Thylacinus cynocephalus* in Tasmania and the moa (order Dinornithiformes) in New Zealand have each been used in extinction dynamics models to infer their probable extinction dates (Brook et al. 2023; Foxon 2024*c*); Paxton (2009) and Paxton and Shine (2016) have performed statistical analyses of viewing distances and consistency in reports of unidentified large marine animals; and the author has applied statistical methods to eel sizes in the context of Loch Ness (Foxon 2023*b*) and the possible association between bigfoot sightings and (misidentified) bear populations across North America (Foxon 2024*a*)

In general, recent studies in the palaeosciences including palaeontology, palaeoecology, and palaeoclimatology have sought to implement a 'best of both worlds' approach, combining indigenous knowledge with conventional scientific approaches (e.g. Green, Billy and Tapim 2010; Mayor 2013; Napier and Chipman 2022; Petzold et al 2020). Traditional knowledge is becoming orthodoxy, and in this regard, cryptozoology was a pioneer.

Orthodox evidence

Although eyewitness sightings represent the bulk of cryptozoological data, not all evidence examined in cryptozoological research pertains to eyewitness testimony; more orthodox forms of evidence have been presented. For example, the pathological examination of the onza described above quite obviously involved a physical, autoptical specimen of the cryptid in question, and this evidence was examined in sophisticated ways including mitochondrial DNA sequencing (Dratch et al. 1996). Orthodox evidence in the form of a physical specimen is not rejected by serious cryptozoologists; rather, it is sought out just as fossils and other specimens are sought in orthodox palaeosciences.

Following earlier surveys of marine animal vocalisations by conventional zoologists (Steinberg, Kronengold and Cummings 2005), hydrophones were used extensively at Loch Ness and Lake Champlain in search of evidence for unknown animals (Mackal 1976; Smith 1985). Results in those contexts were ambiguous, but the methods were relatively orthodox. Unique animal vocalisations have been detected more recently by oceanographers studying marine mammal bioacoustics with hydrophones in the North Pacific, and one such finding may represent an unknown species of baleen whale (Fessenden 2015; Watkins et al. 2004).

Illustrations of animals in ancient works have also become orthodox evidence. Pioneering palaeocryptozoologist and folklorist Adrienne Mayor (1991) made the remarkable discovery that the griffin of ancient Greek culture may have its origins in ancient reconstructions of ceratopsian fossils observed by Issedonian nomads (though not all are convinced of this hypothesis, e.g., see Witton 2016). More recently, McCarthy, Sebo and Firth (2023) noted parallels between ancient and medieval depictions of marine 'monsters' and the newly recognised phenomena of cetacean trap- and tread-water feeding.

Another form of evidence presented (albeit unconvincingly) by cryptozoologists is tracks and prints (e.g., Meldrum (2004, 2007)). Trace fossils studied in the palaeoscience of ichnotaxonomy parallel with, but are not exactly equivalent to, putative cryptid tracks (note: the International Code of Zoological Nomenclature actually excludes traces from animals that are extant, and evolutionary biologist Leigh Van Valen (1983: 155) has said that the comparison between cryptozoological tracks and ichnotaxonomy "perhaps should not be pushed very far").

Finally, the last few decades have seen new examples of photographic taxonomy, or photo-based descriptions of species, not entirely unlike cryptozoological photos of putative cryptids, though the former generally involves far higher quality images from more reputable sources (Krell and Marshall 2017; Marshall and Evenhuis 2015). Just as in the cryptozoological context, this technique remains *extremely* controversial among taxonomists (Ceríaco et al. 2016). Ornithologists and conservationists with Project Principalis at the National Aviary in Pittsburgh, USA have recently argued, using digital photography as evidence, for the present-day persistence of the ivory-billed woodpecker (Latta et al. (2023); otherwise presumed extinct).

Orthodox investigators

In spite of its heterodoxy (or perhaps even *because* of its heterodoxy), cryptozoology has attracted the attention of a considerable number of credible, qualified scientists. Scientific interest in cryptozoology ranges from the 'believing' to the skeptical, the incredulous, and the simply curious.

The board of directors of the now-defunct ISC, and the editorial board of its flagship journal *Cryptozoology*, featured an impressive array of experts in geology, palaeontology, mammalogy, primatology, ichthyology, ornithology, herpetology, anthropology, and linguistics, from such reputable institutions as the Universities of Paris, Maryland, Chicago, Arizona, and British Columbia, and palaeoscience museums such as the Department of Natural History of the Royal Museum of Scotland, the State

Darwin Museum (Moscow), the American Museum of Natural History (New York) and the Smithsonian National Museum of Natural History. In 1999, shortly before the passing of Heuvelmans in 2001, Heuvelmans's collection of over 50,000 articles was donated to the Museum of Zoology in Lausanne, Switzerland (Koenig (1999), now the Department of Zoology at the Cantonal Museum of Natural Sciences), which it maintains to this day.

Cryptozoological articles (skeptical or otherwise) have appeared in such reputable palaeo- and other scientific journals as *Nature* (Gee 2004; Tschernezky 1960), *Proceedings of the Royal Society B: Biological Sciences* (Sykes et al. 2014), the *Journal of Zoology* (Foxon 2024*a*; Paxton 2009), *Science of The Total Environment* (Brook et al. 2023), and *Ecology and Evolution* (Latta et al. 2023); and from distinguished authors the likes of scientist and science communicator Carl Sagan (1976), evolutionary biologist Leigh Van Valen (1983), and palaeontologist George Gaylord Simpson (1984). Indeed, orthodox scientists made up the majority of cryptozoological work from the inception of cryptozoology as a field of research in the 1950s until the dissolution of the ISC in 1998.

Orthodox scientists were (and still are) drawn to cryptozoology for a number of reasons. As the author can attest, one of these is plain curiosity. Although most scientists would agree that the existence of most putative cryptids is extremely improbable, they are undeniably effective at capturing the attention and imagination of the scientific community. Another reason is that even if a cryptid does not represent a new species (and instead represents misidentified known forms), cryptozoology is still a valuable resource for studies of folklore and culture, and investigators have studied cryptozoology in these contexts (e.g. Mayor 2000).

Conclusion

From the above, it is clear that cryptozoology has aspects of both heterodox and orthodox sciences, including elements of zoology, palaeontology, and folklore. In *The Skeptic Encyclopedia of Pseudoscience*, Roesch and Moore (2002: 71) state that "[c]ryptozoology ranges from pseudoscientific to useful and interesting," and this statement seems accurate.

While not being as successful in its discovery of new animal species as Heuvelmans would have liked, and while perhaps not being practiced with as much skepticism as would have benefited its major investigations (namely into the 'surviving' hominids and giant reptiles), cryptozoology has pioneered some methods (e.g., reliance on traditional ecological knowledge) and lines of evidence (e.g., photography) that have entered orthodox science.

Cryptozoology has also acted as something of a 'gateway' to zoology and palaeoscience among young investigators, and occasionally orthodox zoological discoveries have been made through cryptozoolgical investigations, e.g., apparent range extension of known forms (Centre for Fortean Zoology 2022; Lawson 2008b).

The impact of cryptozoology on popular culture is particularly notable. Putative cryptids have featured in movies and television series, and local and national news sources regularly run pieces on cryptid sightings and research.

A final thought considers the unrealised potential of cryptozoology: There are examples of animals whose discoveries were not made through cryptozoological means, but may well have been discovered faster had cryptozoological methods been applied. Perhaps the most famous of these is the coelacanth. Discovered to conventional zoology by Marjorie Courtenay-Latimer in 1938 and described by J. L. B. Smith (1939), the species was well known to Comoran people long before, and like the okapi is the kind of 'living fossil' noted by Heuvelmans; its relatives were known to palaeontologists from the fossil record, but all genera of this group were thought to have become extinct over 60 million years ago (Courtenay-Latimer 1989). The coelacanth is not alone in this regard: A new Somalian snake species

called the Subxaanyo and "believed to be harmless and friendly by the locals and are an important part of their folklore" was only recently described by Šmíd et al. (2023: 351); a range extention of the least wease *Mustela nivalis* to Nunavik in Quebec, Canada, was only recently accepted by zoologists, but its presence there was known to the local peoples for countless years (as 'tigiaq in the Inuktitut language, for which see Pressman 2022); and Carroll et al. (2021: 7) recently described a new ziphiid species, *Mesoplodon eueu*, named after the Māori tohunga (expert) Ramari Stewart who helped collect the holotype. In the latter example, the authors of the study "sought to recognize Indigenous peoples' deep connection with, and knowledge of, the natural environment by consulting with them."

In conclusion, cryptozoology *may* have the potential to contribute to future scientific discoveries, re-discoveries, and general studies of animals; if it is able to rigorise its methods and shake the allure of a focus on 'monsters' (Adams and McCorristine 2017; Rossi 2016), it could, as palaeontologist and evolutionary biologist Henry Gee (2004) put it, "come in from the cold." As for the discovery of new, large animal forms, perhaps cryptozoology arrived on the scene a century or two too late.

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References

Acorn, J. 2023. Personal communication.

Adams, B., and S. McCorristine. 2017. How the search for mythical monsters can help conservation in the real world. https://theconversation.com/how-the-search-for-mythical-monsters-can-help-conservation-in-the-real-world-81769.

Alcock, J. A. 1981. *Parapsychology: Science or Magic?* Oxford: Pergamon Press.

Baird, D. 1989. "Sasquatch Footprints: A Proposed Method of Fabrication." *Cryptozoology* 8: 43–6.

Bauer, A. M. 1992. "Natural Mysteries: Monster Lizards, English Dragons, and Other Puzzling Animals (Review)." *Cryptozoology* 11: 116–9.

Bauer, H. 2022. "Occam's Razor and Bayesian Measures of Likelihood Suggest Loch Ness Monsters are Real Animals: An Example of Premature Discovery with Implications for Public Policy." *Journal of Scientific Exploration* 36 (4): 740–8. https://doi.org/10.31275/20222647.

Bigfoot Field Researchers Organization. 2023. Geographic database of bigfoot/sasquatch sightings & reports. https://bfro.net/GDB/.

Bodley, J. H. 1988. "Sasquatch Footprints: Can Dermal Ridges be Faked?" *Northwest Science* 62 (3): 129–30.

Braithwaite, H., and D. G. Tucker. 1968. "Sonar Picks up Stirrings in Loch Ness." *New Scientist* 40 (628): 564–6.

British Big Cats Society. 2006. Latest news - 15th march 2006 exclusive bbcs report reveals startling new evidence for big cats in britain. http://www.britishbigcats.org/news.php.

Britton, K. M. 1984. "Is the Ri a Tropical Beluga?" *Cryptozoology* 3: 147–9.

Brook, B. W., S. R. Sleightholme, C. R. Campbell, I. Jarić, and J. C. Buettel. 2023. "Resolving When (and Where) the Thylacine Went Extinct." *Science of the Total Environment* 877: 162878. https://doi.org/10.1016/j.scitotenv.2023.162878.

Campbell, G. 2023. The official loch ness monster sightings register. http://www.lochnesssi ghtings.com/index.asp.

Carroll, E. L., M. R. McGowen, M. L. McCarthy, F. G. Marx, N. Aguilar, M. L. Dalebout, S. Dreyer, O. E., et al. 2021. "Speciation in the Deep: Genomics and Morphology Reveal a New Species of Beaked Whale *Mesoplodon Eueu*." *Proceedings of the Royal Society B: Biological Sciences* 288 (1961): 20211213. https://doi.org/10.1098/rspb.2021.1213.

Centre for Fortean Zoology. 2022. Ott 206: Elvis, mothman and the big reveal. https://youtu.be/gzicXqh_IgA.

Ceríaco, L. M., E. E. Gutiérrez, A. Dubois, and M. Carr. 2016. "Photography-based Taxonomy is Inadequate, Unnecessary, and Potentially Harmful for Biological Sciences." *Zootaxa* 4196 (3): 435–45. https://doi.org/10.11646/zootaxa.4196.3.9.

Colbert, E. H. 1936. "Was the Extinct Giraffe (*Sivatherium*) Known to the Early Sumerians?" *American Anthropologist* 38: 605–8.

Coleman, L. E. 1985. *Curious Encounters: Phantom Trains, Spooky Spots, and Other Mysterious Wonders*. Boston and London: Faber & Faber.

Courtenay-Latimer, M. 1989. "Reminiscences of the Discovery of the Coelecanth, *Latimeria Chalumnae* Smith." *Cryptozoology* 8: 1–11.

Darwin, C. 1859. *On the Origin of Species by Means of Natural Selection, or, The Preservation of Favoured Races in the Struggle for Life*. London: John Murray.

Douglas, A. M. 1986. "Tigers in Western Australia?" *New Scientist* 110 (1505): 44–7.

Dratch, P. A., W. Roslund, J. S. Martenson, M. Culver, and S. J. O'Brien. 1996. "Molecular Genetic Identification of a Mexican Onza Specimen as a Puma (*Puma Concolor*)." *Cryptozoology* 12: 42–9.

Driver, R. 1997. "Sea Monsters . . . More Than a Legend?" *Creation* 19 (4): 38–42. URL https://answersingenesis.org/dinosaurs/dragon-legends/sea-monsters-more-than-a-legend/.

Dunlop, G. 2016. Tasmanian tiger: The enduring belief in an extinct animal. https://www.bbc.co.uk/news/world-australia-37283793

Eberhart, G. M. 2005. "Mysterious Creatures: Creating a Cryptozoological Encyclopedia." *Journal of Scientific Exploration* 19 (1): 103–13.

Ellis, R. 1984. "Is the Ri a Porpoise?" *Cryptozoology* 3: 146–7.

Fessenden, M. 2015. Maybe the world's loneliest whale isn't so isolated, after all. https://www.smithsonianmag.com/smart-news/maybe-worlds-loneliest-whale-isnt-so-isolated-after-all-180955005/.

Fisher, J., and C. Northcott. 2023. First-ever images prove 'lost echidna' not extinct. https://www.bbc.com/news/science-environment-67363874.

Fitzpatrick, J. W., M. Lammertink, M. D. Luneau Jr, T. W. Gallagher, B. R. Harrison, G. M. Sparling, K. V. Rosenberg, R. W. et al. 2005. "Ivory-billed Woodpecker (*Campephilus principalis*) Persists in Continental North America." *Science* 308 (5727): 1460–2. https://doi.org/10.1126/science.1114103.

Flannery, T. F., and A. L. Boeadi, and Szalay. 1995. "A new Tree-Kangaroo (*Dendrolagus : Marsupialia*) from Irian Jaya, Indonesia, with Notes on Ethnography and the Evolution of Tree-Kangaroos." *Mammalia* 59 (1): 65–84. https://doi.org/10.1515/mamm.1995.59.1.65.

Foggo, D. 2003. Forensic tests prove leopard is on the loose in lincolnshire. https://web.archive.org/web/20110414130834/https://www.telegraph.co.uk/news/1444524/Forensic-tests-prove-leopard-is-on-the-loose-in-Lincolnshire.html.

Foxon, F. 2023a. "Can Bayesian Statistics be Used to Analyze Phenomena in Folk Zoology?" *Journal of Scientific Exploration* 37 (3): 570–1. https://doi.org/10.31275/20233065.

Foxon, F. 2023b. "The Loch Ness Monster: If It's Real, Could It Be An Eel?" *JMIRX Bio* 1: e49063. https://doi.org/10.2196/49063.

Foxon, F. 2023c. What's in lake champlain? analysing historic sightings of the cryptid known as "champ". *The Skeptic*. https://www.skeptic.org.uk/2023/06/whats-in-lake-champlain-analysing-historic-sightings-of-the-cryptid-known-as-champ/.

Foxon, F. 2024a. "Bigfoot: If It's There, Could It Be a Bear?" *Journal of Zoology*. https://doi.org/10.1111/jzo.13148.

Foxon, F. 2024b. The (In)convenience of Disappearing Evidence in Fringe Zoology. *Skeptical Inquirer*.

Foxon, F. 2024c. "The Moa the Merrier: Resolving When the Dinornithiformes Went Extinct." *Belgian Journal of Zoology* 154: 1–9. https://doi.org/10.26496/bjz.2024.114.

Francis, D. 1983. *Cat Country: The Quest for the British Big Cat*. Exeter: David & Charles.

Gee, H. 2004. "Flores, God and Cryptozoology." *Nature* 431: 1055–61. https://doi.org/10.1038/news041025-2.

Goss, M. 1992. "Alien Big Cat Sightings in Britain: A Possible Rumour Legend?" *Folklore* 103 (2): 184–202. https://doi.org/10.1080/0015587X.1992.9715841.

Goudsward, D. 2016. "The Fabled Florida Giant Octopus - a History." *International Cryptozoology Society Journal* 1: 7–30.

Green, D., J. Billy, and A. Tapim. 2010. "Indigenous Australians' Knowledge of Weather and Climate." *Climatic Change* 100 (2): 337–54.

Greenwell, J. R. 1984. "The Ri: Zoology and Folklore." *Cryptozoology* 3: 151–4.

Greenwell, J. R. 1985. "A Classificatory System for Cryptozoology." *Cryptozoology* 4: 1–14.

Greenwell, J. R. 1986. "Ri-evaluation." *Cryptozoology* 5: 140–4.

Heaney, M. 1990. "A More Appropriate Procedure for Naming Sasquatch." *Cryptozoology* 9: 52–6.

Hemmer, H. 1985. The Onza as a Paleo Cheetah: An Example of Possible Pleistocene Persistence. *Paper presented at the Symposium "Cryptozoology: The Search for Unknown or Supposedly Extinct Animals," III International Congress of Systematic and Evolutionary Biology, July 7, 1985, University of Sussex, Brighton, England.*

Heuvelmans, B. 1958. *On the Track of Unknown Animals*. London: Rupert Hart-Davis.

Heuvelmans, B. 1982. "What is Cryptozoology?" *Cryptozoology* 1: 1–12.

Heuvelmans, B. 1984. "The Birth and Early History of Cryptozoology." *Cryptozoology* 3: 1–30.

Heuvelmans, B. 1986. "Annotated Checklist of Apparently Unknown Animals with Which Cryptozoology is Concerned." *Cryptozoology* 5: 1–26.

Heuvelmans, B. 2007. *The Natural History of Hidden Animals*. London: Kegan Paul.

Hill, S. A. 2013. "Bigfoot DNA Study: Making an End Run around Science." *Skeptical Inquirer* 37 (3): 12–14.

Hocking, P. J. 1996. "Further Investigations into Unknown Peruvian Mammals." *Cryptozoology* 12: 50–7.

Janis, C. 1987. "Fossil Ungulate Mammals Depicted on Archaeological Artifacts." *Cryptozoology* 6: 8–23.

Johnston, H. H. 1900. Sir Harry Johnston on a New Horse. *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London for the Year* 1900: 774–775. URL https://www.biodiversitylibrary.org/item/97409#page/898.

Jones, T., C. L. Ehardt, T. M. Butynski, T. R. B. Davenport, N. E. Mpunga, S. J. Machaga, and D. W. D. Luca. 2005. "The Highland Mangabey *Lophocebus Kipunji*: A New Species of African Monkey." *Science* 308 (5725): 1161–4. https://doi.org/10.1126/science.1109191.

Kerr, T. 2003. "As if Bunyips Mattered… Cross-Cultural Mythopoetic Beasts in Australian Subaltern Planning." *Journal of Australian Studies* 27: 15–27. https://doi.org/10.1080/14443050309387909.

Ketchum, M. S., P. W. Wojtkiewicz, A. B. Watts, D. W. Spence, A. K. Holzenburg, D. G. Toler, T. M. Prychitko, F. Zhang, R. Shoulders, and R. Smith. 2012. "Novel North American Hominins, Next Generation Sequencing of Three Whole Genomes and Associated Studies." *DeNovo* 1: 1–41.

King, J. E., M. A. Woodley, M. A. Sarraf, and J. R. Greenwell. 2020. "Eyewitness Reports Concerning a Putative North American Hominoid: Anomaly or Artifact?" *Zeitschrift für Anomalistik* 20 (1–2): 14–48. URL https://www.anomalistik.de/images/pdf/zfa/zfa2020_12_014_kin g-et-al.pdf.

Koenig, R. 1999. "Museum Accepts Cryptic Collection." *Science* 286 (5442): 1079. https://doi.org/10.1126/article.38935.

Kojo, Y. 1991. "Some Ecological Notes on Reported Large, Unknown Animals in Lake Champlain." *Cryptozoology* 10: 42–54.

Krantz, G. S. 1983. "Anatomy and Dermatoglyphics of Three Sasquatch Footprints." *Cryptozoology* 2: 53–81.

Krantz, G. S. 1986. "A Species Named from Footprints." *Northwest Anthropological Research Notes* 19: 93–9. URL https://cryptozoologicalreferencelibrary.files.wordpress.com/2019/10/krantz-1986.pdf.

Krantz, G. S. 1987. "A Reconstruction of the Skull of *Gigantopithecus Blacki* and its Comparison with a Living Form." *Cryptozoology* 6: 24–39.

Krell, F. T., and S. A. Marshall. 2017. "New Species Described from Photographs: Yes? No? Sometimes? A Fierce Debate and a New Declaration of the Iczn." *Insect Systematics and Diversity* 1 (1): 3–19. https://doi.org/10.1093/isd/ixx004.

Lankester, E. R. 1901. "On *Okapia*, a New Genus of Giraffidae, from Central Africa." *Transactions of the Zoological Society of London* XVI (6): 279–315. URL https://www.biodiversitylibrary.org/item/101600#page/377.

Latta, S. C., M. A. Michaels, T. C. Michot, P. L. Shrum, P. Johnson, J. Tischendorf, M. Weeks, J. Trochet, D. Scheifler, and B. Ford. 2023. "Multiple Lines of Evidence Suggest the Persistence of the Ivory-Billed Woodpecker (*Campephilus principalis*) in louisiana." *Ecology and Evolution* 13 (5): e10017. https://doi.org/10.1002/ece3.10017.

Lavery, T. H., A. Holland, N. Jino, A. Judge, H. Judge, P. Onga, and K. Sese. 2023. "Vangunu Giant rat (Uromys Vika) Survives in the Zaira Community Resource Management Area, Solomon Islands." *Ecology and Evolution* 13 (11): e10703. https://doi.org/10.1002/ece3.10703.

Lawson, A. 2008a. 'yeti hair' to get dna analysis. http://news.bbc.co.uk/1/hi/world/south_asia/7525060.stm.

Lawson, A. 2008b. 'yeti hairs' belong to a goat. http://news.bbc.co.uk/1/hi/world/south_asia/7666900.stm.

LeBlond, P. 1997. "Cryptozoology at the Fuzzy Edge of Ocean Discovery." *La mer* 35: 1–4.

Ley, W. 1941. *The Lungfish and the Unicorn: An Excursion into Romantic Zoology*. New York: Modern Age Books.

Linnaeus, C. 1735. *Systema Naturae*. Leiden: Lugduni Batavorum: Haak.

Loxton, D., and D. R. Prothero. 2013. "Why do People Believe in Monsters?: The Complexity of Cryptozoology." In *Abominable Science!: Origins of the Yeti, Nessie, and Other Famous Cryptids*, New York: Columbia University Press, pp. 296–336. ISBN 9780231153201. https://doi.org/10.7312/columbia/9780231153201.003.0007.

Mackal, R. P. 1976. *The Monsters of Loch Ness*. London, UK: Macdonald and Jane's.

Mackal, R. P. 1983. *Searching for Hidden Animals*. London: Cadogan Books.

Mackal, R. P. 1986. "Biochemical Analyses of Preserved *Octopus giganteus* Tissue." *Cryptozoology* 5: 55–62.

Mackal, R. P. 1987. *A Living Dinosaur? In Search of Mokele-Mbembe*. Leiden: E.J. Brill.

Mackal, R. P. 1992. "Are Lake Monster Sighting Times Biologically or Culturally Based?" *Cryptozoology* 12: 114.

Mangiacopra, G. S., D. G. Smith, D. F. Avery, M. Raynal, R. Ellis, J. R. Greenwell, and B. Heuvelmans 1996. "An Open Forum on the *Biological Bulletin*'s Article." *Of Sea and Shore* 19: 45–50.

Marshall, S. A., and N. L. Evenhuis. 2015. "New Species Without Dead Bodies: A Case for Photo-Based Descriptions, Illustrated by a Striking New Species of Marleyimyia Hesse (diptera, Bombyliidae) from South Africa." *ZooKeys* 525: 117. https://doi.org/10.3897/zookeys.525.6143.

Martin, P. S. 2005. *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*. Berkeley: University of California Press.

Mayor, A. 1991. "Griffin Bones: Ancient Folklore and Paleontology." *Cryptozoology* 10: 16–41.

Mayor, A. 2000. *The First Fossil Hunters*. Princeton, New Jersey: Princeton University Press.

Mayor, A. 2013. *Fossil Legends of the First Americans*. Princeton, New Jersey: Princeton University Press.

McCarthy, J., E. Sebo, and M. Firth. 2023. "Parallels for Cetacean Trap Feeding and Tread-Water Feeding in the Historical Record Across two millennia." *Marine Mammal Science* 39 (3): 830–41. https://doi.org/10.1111/mms.13009.

McGlashen, A. 2022. 'like finding a unicorn': Researchers rediscover the black-naped pheasantpigeon, a bird lost to science for 140 years. https://www.audubon.org/news/like-finding-unicorn-researchers-rediscover-black-naped-pheasant-pigeon-bird.

Meldrum, D. J. 2004. "Midfoot Flexibility, Fossil Footprints, and Sasquatch Steps: New Perspectives on the Evolution of Bipedalism." *Journal of Scientific Exploration* 18 (1): 65–79.

Meldrum, D. J. 2007. "Ichnotaxonomy of Giant Hominoid Tracks in North America." *New Mexico Museum of Natural History and Science Bulletin* 42: 225–31.

Moon, M. 1978. "Ogopogo, Canada's Lake Monster: Oft Seen, Never Snared." *Smithsonian Magazine* 9: 173.

Naish, D. 2010. *Les survivants de l'impossible (1ère partie). Actes du le colloque européen de cryptozoologie, Sea monsters and the 'prehistoric survivor paradigm'*. Brussels: Editions Cryptozoologia, pp. 57–61.

Naish, D., M. Sakamoto, P. Hocking, and G. Sanchez. 2014. "'Mystery Big Cats' in the Peruvian Amazon: Morphometrics Solve a Cryptozoological Mystery." *PeerJ* 2: 291. https://doi.org/10.7717/peerj.291.

Napier, J. D., and M. L. Chipman. 2022. "Emerging Palaeoecological Frameworks for Elucidating Plant Dynamics in Response to Fire and Other Disturbance." *Global Ecology and Biogeography* 31 (1): 138–54. https://doi.org/10.1111/geb.13416.

Nez, N. 2012. Thunderbirds. https://skepticalinquirer.org/newsletter/thunderbirds/.Skeptical *Briefs* 21.4.

Oren, D. C. 1993. "Did Ground Sloths Survive to Recent Times in the Amazon Region?" *Goeldiana Zoologia* 19: 1–11.

Oren, D. C. 2001. "Does the Endangered Xenarthran Fauna of Amazônia Include Remnant Ground Sloths?." *Edentata* 4: 2–5. https://xenarthrans.org/wp-content/uploads/2019/10/Oren_Does-the-endangered-xenarthran-fauna-of-Amazonia-include-remnant-ground-sloths.pdf.

Oudemans, A. C. 1892. *The Great Sea Serpent: An Historical and Critical Treatise*. Leiden: E. J. Brill.

Paxton, C. G. M. 2009. "The Plural of 'Anecdote' Can be 'Data': Statistical Analysis of Viewing Distances in Reports of Unidentified Large Marine Animals 1758–2000." *Journal of Zoology* 279 (4): 381–7. https://doi.org/10.1111/j.1469-7998.2009.00630.x.

Paxton, C. G. M. 2020. "Identifying the Statistical Population of Relevance is Important." *Zeitschrift für Anomalistik* 20 (1–2): 64–5. URL https://www.anomalistik.de/images/pdf/zfa/zfa2020_12_049_king-et-al_comments.pdf.

Paxton, C. G. M., and A. J. Shine. 2016. "Consistency in Eyewitness Reports of Aquatic "Monsters"." *Journal of Scientific Exploration* 30 (1): 16–26.

Petzold, J., N. Andrews, J. D. Ford, C. Hedemann, and J. C. Postigo. 2020. "Indigenous Knowledge on Climate Change Adaptation: A Global Evidence Map of Academic Literature." *Environmental Research Letters* 15 (11): 113007. https://doi.org/10.1088/1748-9326/abb330.

Pierce, S. K., S. E. Massey, N. E. Curtis, G. N. Smith Jr, C. Olavarría, and T. K. Maugel. 2004. "Microscopic, Biochemical, and Molecular Characteristics of the Chilean Blob and a Comparison with the Remains of Other Sea Monsters: Nothing but Whales." *The Biological Bulletin* 206 (3): 125–33. https://doi.org/10.2307/1543636.

Pierce, S. K., G. N. Smith, T. K. Maugel, and E. Clark. 1995. "On the Giant Octopus (*Octopus giganteus*) and the Bermuda Blob: Homage to A. E. Verrill." *The Biological Bulletin* 188 (2): 219–30. https://doi.org/10.2307/1542087.

Pinkstone, J. 2023. Bigfoot is a bear but loch ness is not a giant eel, says data scientist using maths to explain legends. https://web.archive.org/web/20230424104000/https://www.telegraph.co.uk/news/2023/01/22/bigfoot-bear-loch-ness-not-giant-eel-says-data-scientist-using/.

Pontoppidan, E. 1755. *The Natural History of Norway: Containing a Particular and Accurate Accoument of the Temperature of the air, the Different Soils, Waters, Megetables, Metals, Minerals…* London: A. Linde. https://archive.org/details/naturalhistoryNc2Pont.

Pressman, N. 2022. Weasel 'discovery' in nunavik highlights gap between local knowledge and research. https://www.cbc.ca/news/canada/north/least-weasel-nunavik-1.6676192.

Quirk, M. A. 2023. "From *Banib* to Bunyip: Tracking Bricolage and Knowledge Systems in Colonized Aboriginal Spirituality." *Folklore* 134 (1): 111–29.

Radford, B. 2024. "Is Bigfoot Dead?" *Skeptical Inquirer* 48 (1).

Radford, B., and J. Nickell. 2006. *Lake Monster Mysteries: Investigating the World's Most Elusive Creatures*. Lexington: University Press of Kentucky.

Reese, D. S. 1990. "Paleocryptozoology and Archaeology: A Sivathere No Longer." *Cryptozoology* 9: 100–7.

Roesch, B., and J. L. Moore. 2002. "Cryptozoology." In *The Skeptic Encyclopedia of Pseudoscience*. Santa Barbara: ABC-Clio, pp. 71-2.

Rossi, L. 2016. "A Review of Cryptozoology: Towards a Scientific Approach to the Study of "Hidden Animals"." *Problematic Wildlife: A Cross-Disciplinary Approach*, 573–88. https://doi.org/10.1007/978-3-319-22246-2_26.

Rossi, L., S. Gippoliti, and F. M. Angelici. 2018. "The Role of Indirect Evidence and Traditional Ecological Knowledge in the Discovery and Description of New Ape and Monkey Species Since 1980." *Primates* 59 (4): 327–37. https://doi.org/10.1007/s10329-018-0667-6.

Ryan, J. 2021. Is that a thylacine? camera trap footage released but experts dismiss claims of rediscovery. https://www.cnet.com/science/is-that-a-thylacine-camera-trap-footage-released-but-experts-dismiss-claims-of-rediscovery.

Sagan, C. 1976. "If There Are Any, Could There Be Many?" *Nature* 264 (5586): 497. https://doi.org/10.1038/264497a0.

Sclater, P. L. 1901. "On an Apparently New Species of Zebra from the Semliki Forest." *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London for the Year* 1: 50–2. URL https://www.biodiversitylibrary.org/page/31590976#page/90.

Senter, P. J. 2019. "Pterosaur Thunderbird: The Origin of a Fake Native American Legend with an Anti-Evolution Agenda." *Skeptic Magazine* 24 (2): 8–15.

Shackley, M. 1983. *Wildmen. Yeti, Sasquatch and the Neanderthal Enigma*. London: Thames and Hudson.

Shermer, M. 2009. "I Want to Believe." *Scientific American* 301 (1): 33–5.

Sibley, D. A., L. R. Bevier, M. A. Patten, and C. S. Elphick. 2007. "Ivory-Billed or Pileated Woodpecker?" *Science* 315 (5818): 1495–6. https://doi.org/10.1126/science.315.5818.1495.

Simpson, G. G. 1984. "Mammals and Cryptozoology." *Proceedings of the American Philosophical Society* 128: 1–19. https://www.jstor.org/stable/986487.

Šmíd, J., S. M. Fernández, H. S. A. Elmi, and T. Mazuch. 2023. "Diversity of Sand Snakes (Psammophi- idae, Psammophis) in the Horn of Africa, with the Description of a New Species from Somalia." *Zoosystematics and Evolution* 99 (2): 345–61. https://doi.org/10.3897/zse.99.101943.

Smith, J. L. B. 1939. "A Living Fish of Mesozoic Type." *Nature* 143: 455–6. https://doi.org/10.1038/143455a0.

Smith, R. D. 1985. "Investigations in the Lake Champlain Basin, 1985." *Cryptozoology* 4: 74–9.

Spittle, B. 2010. *Moa Sightings*, vol. 3. Dunedin: Paua Press Limited.

Steinberg, J. C., M. Kronengold, and W. C. Cummings. 2005. "Hydrophone Installation for the Study of Soniferous Marine Animals." *The Journal of the Acoustical Society of America* 34 (8): 1090–5. https://doi.org/10.1121/1.1918250.

Swan, L. W. 1958. "Abominable Snowman." *Science* 127: 882–3. https://doi.org/10.1126/science.127.3303.882-b.

Sykes, B. C., R. A. Mullis, C. Hagenmuller, T. W. Melton, and M. Sartori. 2014. "Genetic Analysis of Hair Samples Attributed to Yeti, Bigfoot and Other Anomalous Primates." *Proceedings of the Royal Society B: Biological Sciences* 281 (1789): 20140161. https://doi.org/10.1098/rspb.2014.0161.

Taylor, D. C. 2018. *Yeti: The Ecology of a Mystery*. Oxford: Oxford University Press.

The Guardian. 1960. From the archive: Yeti scalp (they say it's 240 years old) is here – by air. https://www.theguardian.com/world/2009/dec/23/yeti-scalp-nepal-edmund-hillary.

Thompson, R. 1941. *Books of the Times*, vol. 19. New York: New York Times, April 22.

Thunig, F. 2017. "Kryptozoologie als legitimationsstrategie im kreationismus." *Zeitschrift für junge Religionswissenschaft* 12: 1–17. https://doi.org/10.4000/zjr.859.

Tschernezky, W. 1960. "A Reconstruction of the Foot of the 'Abominable Snowman'." *Nature* 186: 496–7. https://doi.org/10.1038/186496a0.

Tschernezky, W., and C. R. Cooke. 1975. "The Unpublished Tracks of Snowman or Yeti." *The Mankind Quarterly* 15 (3): 163–77.

Turnbull, T. 2022. Black-naped pheasant-pigeon sighted in png for first time in 140 years. https://www.bbc.com/news/world-asia-63672501.

University of Oxford. 2023. Found at last: Bizarre, egg-laying mammal finally rediscovered after 60 years. https://phys.org/news/2023-11-bizarre-egg-laying-mammal-rediscovered-years.html.

Valentiner, W. R. 1931. "A Dragon Relief of the Time of Nebuchadnezzar." *Bulletin of the Detroit Institute of Arts of the City of Detroit* 12 (7): 78–81. https://doi.org/10.1086/BULLDETINST41499223.

Van Valen, L. 1983. "Cryptozoology, Paleontology, and Evidence." *Cryptozoology* 2: 155–7.

Verrill, A. E. 1897. "A Gigantic Cephalopod on the Florida Coast." *American Journal of Science* 3 (13): 79.

Wagner, R. 1982. "The Ri: Unidentified Aquatic Animals of new Ireland, Papau New Guinea." *Cryptozoology* 1: 33–9.

Wagner, R. 1984. "The Nature of the Ri." *Cryptozoology* 3: 149–51.

Wall, J. E. 1983. "Cryptoletters." *International Society of Cryptozoology Newsletter* 2 (2): 10.

Watkins, W. A., M. A. Daher, J. E. George, and D. Rodriguez. 2004. "Twelve Years of Tracking 52-hz Whale Calls from a Unique Source in the North Pacific." *Deep Sea Research Part I: Oceanographic Research Papers* 51 (12): 1889–901. https://doi.org/10.1016/j.dsr.2004.08.006.

Wegener, A. 1924. *The Origin of Continents and Oceans*. London: Methuen & Co. Ltd.

Weidensaul, S. 2002. *The Ghost with Trembling Wings*. New York: North Point Press.

Wilcove, D. S. 2005. "Rediscovery of the Ivory-Billed Woodpecker." *Science* 308 (5727): 1422–3. https://doi.org/10.1126/science.1114507.

Wild, M., and M. Balke. 2018. "New Localities, an Update on the Conservation Status and Ethnographic Notes for the Dingiso Tree Kangaroo, Dendrolagus Mbaiso Flannery, Boeadi et Szalay (Diprotodontia: Macropodidae)." *Mammalia* 82 (6): 607–10. https://doi.org/10.1515/mammalia-2016-0164.

Wiley, J. P. 1976. "Cameras, Sonar Close in on Denizen of Loch Ness." *Smithsonian Magazine* 7: 96–102.

Williams, T. R. 1985. "Identification of the Ri Through Further Fieldwork in New Ireland, Papua New Guinea." *Cryptozoology* 4: 61–8.

Witton, M. P. 2016. Why *Protoceratops* almost certainly wasn't the inspiration for the griffin legend. http://markwitton-com.blogspot.com/2016/04/why-protoceratops-almost-certainly.html.